“Vermicomposting of Biodegradable Waste Using Different Types of Earthworm Species A Comparative Study”

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Introduction :-

Vermicomposting is a simple biotechnological process of composting. In which certain species of earthworms are used to enhance the process of waste conversion and produce a better product. Edwards, C.A., Arancon, N.Q. and Sherman, R (2011). In, recent decade, the role of earthworm has cought attention of researcher when are evolution in unfolding in vermiculture studies for vermicomposting of diverse organic wastes by waste eater earthworms into a nutrional organic fertilizer. A.Sujit 2012, " Vermicompost, the story, of organic Gold : A Review: Agriculture and Ecological Research unit Biological Sciences Division, Indian statistical Division, Indian Statistical Institute, Kolkota, India, August 2012.

Earthworms vermicompost is a treasure of highly nutritive, organic fertilizer, act as growth promoter helps in quality of crop yield including corn silage for cattles. It is the need to Conserve soil erosion and waste management for sustainable development and nutrious fodder for cattles in adversed condition. Earthworm population decreases with soil degradation and thus can be used as a sensitive indicator of soil degradation (Dominguez and Edwards, 2004). Eisenia foetida earthworm converts the organic waste into vermin-compost efficiently compared to other species (Loh, et al 2005 : Pattnaik and Reddy, 2010).

Earthworms are blessed by nature with the capacity of detoxify and disinfect any product-solid or liquid. They also have innate defense mechanisms and strong immune system. Vermicomposting is self promoted, self-regulated, self-improved and self-enhanced, low or no-energy requiring Zero waste technology, easy to construct, operate and maintain. Shweta Singh, Rajiv K. Sinha, in advanced Organic Waste Management,2022.

Edwards et al (2011) proposed that vermicomposting facilities must fous on waste management. Vermicompost could be used by farmers to improve

agriculture soils and crop production.

Earthworms swallow soil and raw organic matter as their diet and pass it through their digestive tract, which converts it into fine compost and takes it out of their body in the form of small castings. This compost is called vermicompost. The study of earthworms was started by charls darwin who made the first report on the role of earthworms in the breakdown of organic matters in the eco system in 1881 (Lowe et al., 2014). Earth worms are good friend of farmers they work 24 hrs in agriculture having great ecological role and make the soil nutritious and more aerated that helps in more crop production.

Earthworms decompose the organic waste into organic manure. By the use of vermi techniques (use of earthworms and organic waste) in the presence of oxygen organic waste turns into manure. Gunadi and Edward (2003) reported that most Eugenie foetida could not survive without a new substrate addition for 60 weeks. (8 earthworms in 100 gm various wastes with a moisture content if 80-85%). Best vermicompost depend upon the good raw material. Manna et al (1997) pointed out that a favorable feeding environment is a prerequisite for the success of vermicomposting in outdoor culture beds". Because of this, Suitable Species used for Vermiculture :-

Eisenia fetida, Eudrilus eugeniae, Lumbricus rubellus**, Perionyx excavates**

Eisenia Andrei these earthworm species to be the most potential earthworms for breakdown of organic refuse. Edwards (1998). These earthworms exhibit maximum activities between June and December and have better efficiency of producing more compost (Prema et al., 2004). Earthworms who convert agro- waste into wealth by aerobic decomposition vermicomposting method directly help in production of Highly nutritious "Brown Gold" to improve soil ecology. Vermicomposting is a double process in which earthworms play a major role in digesting the organic wastes to worm manure (vermicompost) and microbes play a secondary process (humification) in decreasing the C:N ratio and enhancing the decomposition (worm cast) while mitigating CO2 emission and save the essential nutrients into nutrient rich vermicompost.

Review of Literature :-

Vermicomposting is far superior to traditional composting technique, produce valuable nutrient rich fertilizers for plant growths. **Journal of Envt Management.**

Earthworms, besides producing enormous amount of worm casts over the years, modify the structure of the soil. They act as 'natural miniature factories' (Kitturmath et al., 2007). Vermicompost induced soil biology and condition improvement led to an increase in crop productivity. Also improved in the presence of vermicompost is plant nutrient uptake and vegetative growth. This is perhaps due to its contributions to the increase in soil porosity. Vermicompost contains essential micronutrients and the nutrient status is in line with that reported by earlier researchers.

Carbon is a major component of organic, molecules, which are the building blocks of all organisms and thus are needed as the source of energy for the composting process. Ismail 2005, Ansari and Jaikishan 2011; Ansari and Rajpersaud 2012) Physico chemical changes during vermicomposting of water hyacinth. The role of earthworms in Soil fertility is known since 1881 when Darwin (1809-1882) published his last scientific book entitled The formation of vegetable mould through the action of worms with observations on their habits. Integrated Vermicomposting and green roof techniques for food production in urban and rural areas Ann Civil Envt Engg 2022, 6:074-076-Mohamed Abul- Soud* -Vermicomposting could contribute in mitigate carbon dioxide emissions and saving essential nutrients and energy via recycling urban organic wastes to vermicompost. The quality of vermicompost depend on type of raw materials (substrate) and species of earthworms used for composting, ph, temp, humidity, aeration etc. climatic factors. Am-Furnas. J. Agric. & Environ. Sci, 5(3) 01-55, 2009. Vermicolmposting is the process of producing compost by utilizing earthworms to turn the organic waste into high-quality compost that consists mainly of worm cast in addition to decaled organic matter.

Devi j, Prakash M. (2015), Microbial Population Dynamics Daring Vermicomposting of three Different Substrates amended with crowding. Int J Curr.Microbiol Appl Sci 4/2 : 1086-

1092. Yatoo A.M.; Rasool.S; Ali,S; Majid.S;Rehman.M.U; Ali M.N; Faroog S. Vermicomposting, An eco Friendly approain for recycling/Management of org. Wastes T, Bioremediation and Biotechnology, Springer, Cham, Switzerand, 2020, p8.167-187. The most popular species of earthworm used for producing vermicompost is Eudrillus eugeniae.

Objectives :-

01. To Know the effect of substrate composition on the nutrients of vermicompost prepared by different types of earthworms.
02. To identify the most suitable earthworm species for successful treatement of biodegradable waste.
03. To investigate how Good raw material increase quality of vermicompost.
04. To compost organic wastes not for the 'disposal of solid organic wastes but alsoto produce Superior quality manure to feed our nutrient matter hungry soils.
05. To conserve biodiversity, Improve soil fertility, Use of eco friendly fertilizer. Waste to wealth.
06. Need of farmer training. Create public awareness.
07. Bioremediation technique.

Materials :-

01. Crop residues, Cow Dung
02. Vegetable waste, Plants wastes, Dry leaves etc.
03. Waste from Agro-Industries
04. Bio-degradable portion of urban and rural wastes.
05. Bagasse, Grass etc.

Methodology :-

Bedding is said to have good bulking potential because of the high straw content to help the corm to received exygen and also relatively good moisture retention. Urban waste can be converted into a potential plant nutrient i.e., Vermicompost which can be utilized for sustainable land restoration practices- Bansal and Kapoor, 2000. Bansal, S. and K.K.Kapoor (2000) “Vermi-composting of

crop residues and cattle dung with Eisenia foetida" Bio resource Technology, Vol. 73, No. 2. Pp.95-98-98, 2000.

HDPE VERMICOMPOST BEDS are used with Deferent layers of deferent organic waste in Beds Method. These beds are normally in the size of 12 Feet Length X 4 Feet Width X 2 Feet Height, provide Nets at the sides for Aeration, and a Successful Model where can harvest around 500 kgs of vermicompost in 60 Days time Common raw materials and common species are used in deferent Beds levels in my study.

Benefits of Vermicompost :-

01. Enriches soil with micro-organisms. Improves nutrient recycling in Soil.
02. Addition of vermicompost to soil attracts deep-burrowing earthwormsalready present in the soil.
03. The worm castings are rich in human acids, which condition the soil andhelps in balance pH.
04. Helps in plant growth Enhances germination and crop yield .
05. Earthwarms are an important component of soil ecology and nutrient cycling,as they break down organic matter and release nutrients such as NPK that can support plant growth (edwards et an.,2022) .
08. Ecofriendly vermitransformation technology has emerged as a Sustainable and eco-friendly alternative for waste management it is necessary ensure environmental sustainability.

Hypothesis :-

H1. Role of earthworm : biodiversity in soil fertility.Bio indicator of soil ecosystem agro-waste management.

H2. Sustainable development of agro sector Environmental Conservation in India Need of Vermiculture revolution Minimize the use of chemical fertilizer.

International Status :-

Adding cow manure as a bulking agent reduces mortality because adding cow manure provides a better environment for earthworms than organic waste alone. Gong, X; Li, S., Carson,

MA; Chang S.X.; Wu, Q; Wang, L; An,Z.; Sund, X. Spent mushroom substrate and cattle manure amendments enhance the transformation of garden waste into vermicomposts using the earthworm eisenia foetida. Increasing population need more food demand so farmer used large amount of chemical fertilizer to get more quantitative crop yield, which directly effect of soil texture and human health and So need of vermicompost used as a biofertilizer is essential for human health, and Nature which help to improve Ecology of soil.

During the breakdown of organic substrates, ammonium, phosphate, potassium, nitrate and calcium ions are released, causing an increase in EC. Vermireactors operating in continuous flow fashion perform better in waste bioconversion than the batch and windrows techniques. (Matthew Chekwube Enebe, Mariana Erasmus 1 Nov 2013). Moreover the techno-economic assessment (TEA) of various by products of vermin-technology, including vermicompost, casting, treated effluent, and earthworms, strengthness their acceptability in the global market. Sanket Dey Chowdhury (2022).

National Status :-

Nutrient enrichment of vermicompost by supplementing the free-floating Macrophyte biomass with cow manure and organic nutrient supplements (Eggshell, bone meal, banana peel and tea waste). Ali Mohd Yatoo,Sartaj Ahamad Bhat, Md. Niamat Ali, Zahoor Ahamad Baba, Zarka Zaheen. Agronomy 2022 12(6),1303. Vermicomposting is produced from various types of organic residue, including sewage, sludge, animal waste, crop residues, kitchenwaste, floral waste and industrial residues.(Diksha et al.,2022; Kumar et al.2021). Vermicomposting is considered an economically Viable, socially acceptable and environmentally friendly technique that uses earthworms ot trans from any type of Organic waste into highly valuable organic fertilizer. There fore, there is a need to search for the current status of various organic wastes Management with help of different species of bioreactors to improve quality of Vermicompost for sustainable development.

- **Significance of Vermitechnology.**

01. It provides vermicompost, vermiwash.
02. It supplies organic fertilizer, reduce organic weste.
03. The worm casts are used as manure for crops and gardens.

04. The earthworms can be converted into vermiprotein. The vermi-protein can be utilized for poultry and fish feed.
05. It provides employment opportunity.
06. The vermiwash can be used as foliar spray on crops.
07. It has tremendous prospects in converting agro-wastes and city garbageinto valuable agricultural input.
08. Small and marginal farmers produce vermicompost on their own for their crops.
09. Vermicompost is an excellent manure for home gardens kitchen garden and commercial plant nurseries in urban ares.

Proposed plan of work

Year-wise work plan of research.

The research duration in the present study is about four years from Year March-2023 to Dec.2027.

First-year – course work and extensive literature survery.

Second-year- protocol standardization and data collection.

Third-year : Result data analysis.

Fourth-year : research paper publication, thesis writing, and submission of thesis.

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